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Contents

General Articles :

Piperazine Adipate as an Equine Anthelmintic 159
D. Poynter, B.SC.

A Flap Operation for the Surgical Correction of Chronic Otitis in the Dog and Cat 163
E. Wynn Jones, PH.D., M.R.C.V.S.

An Emaciation Syndrome in Malayan Cattle 167
A. H. Foster, M.R.C.V.S.

Victoria Veterinary Benevolent Fund 169

In Parliament 170

Current Literature :
Digest 171

News and Comment 172

Correspondence :

Myxomatosis 173
Alastair N. Worden, M.A., B.SC., F.R.I.C., M.R.C.V.S.

A Legitimate Grievance 174
C. R. A. Powell, M.R.C.V.S.

Intravenous Injection of Succinylcholine chloride 174
Clarence M. Stowe, B.SC., V.M.D.

The Scheme for Animal Nurses 175
J. E. Johnson, M.R.C.V.S.

Leukaemia in the Horse ... 176
Wm. C. Miller, M.R.C.V.S., F.R.S.E.

Piperazine Adipate as an Equine Anthelmintic

BY

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Introduction

IN the past few years attention has turned to the potentialities of piperazine compounds as anthelmintics. Hewitt, Kushner, Stewart *et al.* (1947) found that "Hetrazan," 1-diethylcarbamyl-4-methylpiperazine hydrochloride, was an efficient compound for the control of naturally acquired filarial infections in rats and dogs. Later Hewitt *et al.* (1948) showed that it could also be used for the treatment of ascariasis in dogs. Todd, Hansen *et al.* (1949) discovered that the compound had no effect upon the larval forms of *Strongylus vulgaris* present in the equine cranial mesenteric artery. Fayard (1949) recorded that piperazine was an efficient anthelmintic against ascarids in man. Mouriquand, Roman & Coisnard (1951) turned their attention to piperazine hydrate, finding it to be active against *Rhabditis macrocerca in vitro* as well as against *Aspicularis tetraptera* and *Syphacia obvelata*, mouse oxyurids, *in vivo*. They also used this compound for the treatment of threadworms in children with good results. Standen (1953) also found that piperazine hydrate was active against *A. tetraptera* in mice, and White & Standen (1953) showed that the anthelmintic was as efficient as gentian violet for the treatment of human enterobiasis. Brown, Chan, & Hussey (1954) recently tested 32 piperazine compounds against *S. obvelata* in mice, discovering that several exhibited considerable anthelmintic activity, this being more pronounced in the simple base and its salts than in the complex substituted compounds. Hartley (1954) states that piperazine adipate has proved effective against a wide range of roundworms and hookworms. Sloan, Kingsbury, & Jolly (1954) examined some 40 piperazine compounds for evidence of anthelmintic activity and found that the adipate had great potentialities in the veterinary field. Leiper (1952) demonstrated that piperazine and some of its compounds were effective against ascarids in hens, and later (1954) the same worker reported good results with polymeric piperazine-1-carbodithioc acid against *Ascaris lumbricoides* and *Oesophagostomum dentatum* in pigs.

Experimental Procedure

Egg counts and larval differential counts were carried out on 14 horses prior to and after the administration of piperazine adipate. All horses were dosed at a rate of 10 grammes of anthelmintic per 100 lb. bodyweight. No preliminary fasting was carried out and the compound, dissolved in a minimum quantity of water, was introduced by stomach tube. No follow-up treatment was necessary and no adverse effects attributable to the anthelmintic were observed.

For reasons of economy efficiency was largely estimated by egg counts. One pony was, however, sacrificed so that a critical test could be conducted.

Results

A. Egg Counts.

Table I presents the summarised results for all animals. It will be noted that in 11 cases the ascarid egg count was reduced to zero, this usually taking three or four days. Animal No. 6 later showed a zero ascarid egg count, but in animal No. 1, despite that fact that faeces were examined for 16 consecutive days after dosing, no fall to zero was seen. This horse was suffering from obstructive jaundice and was in poor condition.

Evidence from egg counts points to the conclusion that piperazine adipate is an efficient anthelmintic against *Ascaris equorum*.

TABLE I

THE RESULTS OF DOSING WITH PIPERAZINE ADIPATE. EGG COUNTS ARE SHOWN BEFORE AND AFTER TREATMENT

Animal	Breed	Age	Dose, grammes	Strongyle e.p.g.		Ascarid e.p.g.	
				Before	After	Before	After
1	T.B.	3 years	80	33	1	300	20
2	× bred pony	1 year	40	301	193	8	0
3	„	1 „	40	147	50	120	0
4	„	3 months	20	60	1	100	0
5	„	4 „	25	49	15	400	0
6	„	4 „	20	500	3	200	1
7	„	4 „	20	109	6	300	0
8	„	3 „	20	340	0	300	0
9	„	4 „	20	52	1	400	0
10	T.B.	1 year	50	219	186	117	0
11	× bred pony	1 „	40	1,600	45	25	0
12	„	2 years	40	337	15	0	0
13	T.B.	1 year	45	142	30	16	0
14	„	4 years	80	132	0	24	0

(T.B. = Thoroughbred)

A check was also kept on the strongyle egg count and it will be observed that this too showed a decline, most marked in the foals. This is probably due to the fact that these animals were young, in consequence of which the strongyle populations consisted mainly of *Trichonema* spp., the members of *Strongylus* spp. not yet having had enough time to complete their prepatent periods. As will be mentioned later, piperazine adipate has a high efficiency against small strongyles and a lower efficiency against large strongyles. It is thus reasonable to presume that the marked drop seen in the foals' egg counts is due to the fact that the majority of strongyles present were susceptible to the anthelmintic.

B. Critical Test.

This was performed on animal No. 3. Egg counts were carried out prior to, and after, the administration of the anthelmintic. All faeces were collected after dosing the animal, any helminths contained therein being removed, counted and identified. It was noticed that many small strongyles were alive when passed. All the ascarids were dead, some showing brown discoloration. Small strongyles were the first to appear in the faeces after dosing, these were followed by the ascarids and large strongyles.

Faeces passed on the fourth day after administration of the anthelmintic contained no parasites and collection was, therefore, suspended. The animal was slaughtered on the seventh day when surviving parasites were removed from the alimentary canal, counted and identified. The results of this critical test are shown in Table II. From the information obtained it was possible to gain some indication of the percentage efficiency of piperazine adipate against certain parasites of horses. The anthelmintic completely removed the small strongyle worm burden, and individuals of *Ascaris equorum* were similarly eliminated. In assessing the results of this critical test it should be noted that the horse harboured only a light infection with these helminths particularly *A. equorum*.

TABLE II

THE RESULTS OF A CRITICAL TEST WITH PIPERAZINE ADIPATE ON ONE PONY (ANIMAL NO. 3). INDICATIONS OF THE PERCENTAGE EFFICIENCY AGAINST DIFFERENT SPECIES ARE SHOWN. FIGURES SHOWN FOR *Oxyuris equi* ARE NOT CONSIDERED SIGNIFICANT

Species	Number passed in faeces	Number recovered at *post-mortem* examination	Percentage efficiency
Gastrophilus spp. ...	0	42	0
Ascaris equorum ...	4	0	100
Small Strongyles ...	629	0	100
Strongylus vulgaris...	17	10	62·9
„ *edentatus*	2	29	6·4
Oxyuris equi (4th stage larvae) ...	1	2	33·3

Faeces were also collected from animal No. 2 after dosing. Once again worms ceased to be passed on the fourth day. Helminths recovered are shown below:—

Ascaris equorum ...	...	1
Trichonema spp. ...	...	514
Strongylus vulgaris	...	31
Poteriostomum spp.	...	19
Triodontophoros spp.	...	4
Oxyuris equi ...	...	1 (4th stage larva)

It will be noticed that no *Strongylus edentatus* individuals were passed. Efficiency against this species was, therefore, zero in this case. No *Gastrophilus* spp. larvae were passed.

C. Confirmatory Evidence Obtained by Larval Differential Counts.

Although no further animals were available for critical tests it was realised that an estimation of the relative efficiency against different species could be obtained by hatching eggs passed both before and after dosing. Identification of infective larvae could be carried out and any marked change in the differential picture ascertained. In view of the poor efficiency which piperazine adipate had against *S. edentatus* in animal No. 3, a sharp and immediate increase in the percentage of the eggs of this species in faeces samples taken soon after dosing would be expected. This was found to be the case as is shown in Table III. This effect cannot be demonstrated in foals since the prepatent period for *S. edentatus* is 11 months and consequently they will not be harbouring members of this species in their intestines.

TABLE III

CHANGES IN STRONGYLE EGG COUNTS AND DIFFERENTIAL LARVAL COUNTS CARRIED OUT BEFORE AND AFTER DOSING. NOTE RISE IN THE PERCENTAGE OF *Strongylus edentatus* AFTER DOSING

Animal	Date	Strongyle e.p.g.	Differential larval counts: Percentage small strongyles	Percentage *S. vulgaris*	Percentage *S. edentatus*
2	7. 5.54	301	76	11	13
	11. 5.54	40 grammes piperazine adipate given			
	12. 5.54	100	66	3	31
	24. 5.54	193	3	1	96
	6. 7.54	343	68	3	29
3	13. 4.54	371	68	30	2
	7. 5.54	147	38	46	16
	11. 5.54	40 grammes piperazine adipate given			
	18. 5.54	50	4	10	86
10	19.10.54	219	71	11	18
	19.10.54	50 grammes piperazine adipate given			
	27.10.54	186	1	46	53
	3.11.54	166	0	34	66
	15.11.54	255	2	49	49
	19.11.54	234	18	46	36
	26.11.54	194	36	34	30
	6.12.54	332	36	39	25
11	19.10.54	1,600	81	0	19
	22.10.54	40 grammes piperazine adipate given			
	1.11.54	45	—	—	—
	11.11.54	125	57	0	43
13	1.12.54	142	55	17	28
	1.12.54	45 grammes piperazine adipate given			
	13.12.54	30	3	37	60
	28.12.54	37	3	31	66

The percentage rise of *S. edentatus* is, however, demonstrated in yearlings and older horses, the probable explanation being that there is less efficiency against *S. edentatus* than any other strongyle.

A similar phenomenon is seen after dosing with phenothiazine. Treatment with this compound results in a rise in the percentage of *Strongylus* spp. eggs in the faeces as reported by Gibson (1953) and Poynter (1954). This rise is transitory, the small strongyles eventually accounting, as they did before, for the majority of eggs laid. Similarly, the rise in the percentage of *S. edentatus* eggs after treatment with piperazine adipate is also transitory. This is probably due to the arrival in the lumen of the intestine of *Trichonema* spp. which have just left the mucous and submucous layers of the large intestine, their previous exit having been inhibited by the adult individuals already established there, a theory already advanced by Gibson (1953) in his work on phenothiazine.

Animal No. 10 eventually had to be destroyed on December 7th, 1954, that is some seven weeks after the administration of piperazine adipate. Such a time lag prohibited the performance of a critical test, since an ample period had elapsed for fresh helminths to establish themselves in the alimentary canal. All parasites were, however, removed at the *post-mortem* examination, these were later counted and identified. The results are shown below:—

Gastrophilus spp. ...	...	18
Ascaris equorum ...	...	7 (immature)
Trichonema spp. ...	...	282
Strongylus vulgaris	...	140
Strongylus edentatus	...	59
Triodontophorus spp.	...	5
Oxyuris equi ...	...	26

The individual helminths found could have been present at the time of dosing and survived the anthelmintic treatment or they could have arrived in the alimentary canal during the seven weeks which elapsed between dosing and death. The differential larval counts carried out during this period (Table III, animal No. 10) give some information on this topic.

It will be seen that after dosing the incidence of small strongyle eggs in the faeces was low. Since it has already been shown that piperazine adipate had in animal No. 3 a high percentage efficiency against these parasites, the most likely explanation is that the small strongyles were eliminated as a result of anthelmintic treatment. Many were passed in the faeces of animal No. 10 after treatment and it seems, in view of the differential counts, that the majority were evacuated.

Table III shows the beginning of the rise in the percentage of small strongyle eggs. These eggs were probably laid by the individuals of *Trichonema* spp. enumerated above which arrived in the gut after treatment.

In view of the size of the seven immature ascarids found at the *post-mortem* examination, 5 to 7 cm., it seems unlikely that they were present in the duodenum at the time of treatment.

There can be no doubt that at least some part of the *Strongylus* spp. population withstood the effect of the anthelmintic, since eggs of these parasites were continually passed.

These observations are, then, in keeping with the theory that after anthelmintic treatment, individuals of *Trichonema* spp. which have been undergoing histotropic stages of development enter the lumen of the gut, their previous entry having been prevented by already established individuals.

In Vitro Observations

Goodwin & Standen (1954) recently reported that piperazine citrate in a concentration of 1:500 has a narcotic effect on *Ascaris lumbricoides in vitro*.

Similarly piperazine adipate appears to have a narcotic effect upon individuals of *Ascaris equorum* kept *in vitro*. Ascarids were placed within flexible polythene tubes, kept at a standard temperature in a water-bath. The details are described elsewhere (Poynter, 1955). 300 mg. of the adipate were added to 300 ml. of modified Baldwin's solution containing individuals of this species, *i.e.* a concentration of 1:1,000, whilst other individuals were placed in the modified Baldwin's solution alone. After one hour the fluid in the control tube was perfectly clear and the ascarids were very active. The worms to which the anthelmintic had been added, however, showed decreased motility, and the fluid containing them became turbid; in fact after two and a half hours only slight movement could be distinguished, whereas, after 20 hours the control ascarids were still moving well. Moreover, the ascarids in piperazine adipate were, after 20 hours, surrounded by mucus, the whole of the fluid in the tube being yellow, in contrast to the comparatively clear fluid surrounding the ascarids in the control tube. At this point the contents of both tubes were renewed with fresh modified Baldwin's solution, no anthelmintic being added. In this solution the individuals which had been affected by the drug revived. They were, therefore, allowed to remain in the uncontaminated solution for seven hours, after which time 300 mg. of piperazine adipate were again introduced. The next morning, *i.e.* 16 hours later, the treated worms showed no movements and were once again covered in mucus, whilst the controls were moving normally in comparatively clear fluid. The treated specimens were again revived in fresh Baldwin's solution and after seven hours appeared as active as the control individuals.

It seems, therefore, that the compound must act by paralysing the normal movements of the ascarids, rendering them inert, in consequence of which they are passed along the alimentary tract to the exterior, by the normal peristaltic movements of the intestines.

The Anthelmintic Effect of Diethylcarbamazine Acid Citrate

It is interesting at this point to mention a limited number of tests which were carried out in 1953 with another piperazine compound, namely the more complex diethylcarbamazine acid citrate (" Banocide," " Hetrazan," " Caricide "). This compound has been successfully applied to the treatment of ascariasis in humans, dogs, and cats, apart from its use in the control of filarial infections. Its high cost, however, largely prohibits its use in the medication of larger animals such as horses.

Experiments were conducted using six cross-bred ponies. The compound was administered, dissolved in the minimum quantity of water, by stomach tube. No preliminary fasting was carried out and all ponies were dosed at the rate of 25 mg. per lb. bodyweight. Results are shown in Table IV.

TABLE IV

THE EFFECT OF DIETHYLCARBAMAZINE ACID CITRATE OF THE EGG COUNTS OF SIX CROSS-BRED PONIES. THERE IS A MARKED REDUCTION IN ASCARID EGG COUNTS. THE EFFECT ON THE STRONGYLE EGG COUNT IS NOT CONCLUSIVE

Animal	Dose, grammes	Age	Strongyle e.p.g.		Ascarid e.p.g.	
			Before	After	Before	After
15	5·0	1 year	0	0	2,000	3
16	4·1	4 months	190	600	1,000	9
17*	4·1	4 ,,	500	193	2,600	15
18	8·1	1 year	2,100	400	0	0
19	7·9	1 ,,	54	12	0	0
20	10·0	1 ,,	2,200	1,500	0	0

* This animal received 5 grammes of phenothiazine as well as the diethylcarbamazine acid citrate.

It will be seen that there is a marked reduction in ascarid egg counts. The effect of the compound on the strongyle egg counts was not significant. In some cases drops occurred, but most counts remained in the hundreds. No significant differences could be seen in differential larval counts carried out before and after dosing.

It is difficult with existing data to compare the efficiency of piperazine adipate with that of diethylcarbamazine acid citrate, for the former was given at the rate of 100 mg. per lb. bodyweight whilst the latter was administered at the rate of 25 mg. per lb. bodyweight. This difference could account for the divergence of activity against strongyle parasites seen between the two compounds.

Summary and Conclusions

1. As a result of tests on 14 horses it is concluded that piperazine adipate at a dosage rate of 10 grammes per 100 lb. bodyweight is an efficient anthelmintic against *Ascaris equorum* and the small strongyles of horses. It is partially effective against *Strongylus vulgaris*, but has little or no action on *Strongylus edentatus* and *Gastrophilus* spp.

2. Diethylcarbamazine acid citrate at a rate of 2.5 grammes per 100 lb. bodyweight has an action on *Ascaris equorum*.

Acknowledgments—Thanks are due to the Director of the Equine Research Station for helpful suggestions and criticisms, and to E. J. Roberts, M.R.C.V.S., who used piperazine adipate on four horses under his care which required treatment for ascarids.

The writer is indebted to the workers at the Cooper Technical Bureau who first realised the potentialities of piperazine adipate in veterinary helminthology and suggested its use in horses, particularly to J. E. N. Sloan, B.SC., whose correspondence during the trials is much appreciated. The gift of piperazine adipate is also gratefully acknowledged.

The " Banocide " was kindly supplied by Burroughs Wellcome & Co., and thanks are due to Mr. J. Leslie and Dr. R. F. Montgomerie.

(Continued at foot of col. 1, page 163)

A Flap Operation for the Surgical Correction of Chronic Otitis in the Dog and Cat

BY

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IN 1931, Formston & McCunn described an operation for the relief of chronic otitis externa. In this operation a triangular section of cartilage was removed from the lateral wall of the canal. Since this time several modifications have been described. These vary according to the degree and manner in which the lateral wall of the canal is incised and resected. Construction and mobilisation of a cartilaginous flap for aural resection was first described by Zepp.

The operation is indicated in cases of recurrent and chronic otitis externa. Whatever the operative technique employed, it should provide complete drainage of the external ear. The smallest pocket remaining at the ventral limit of the vertical part of the canal predisposes to incomplete recovery or recurrence of the condition. In addition, thorough opening of the vertical canal throughout its length is an advantage. This overcomes the possibility of thickened rugae impinging upon each other and causing persistent irritation.

Owing to coexistent infection and the accumulation of discharge within the canal, adequate preoperative preparation is of considerable importance. This, in addition to the usual routine procedure, should include, wherever possible, the use of an antibiotic likely to be effective against the infection present. Since many organisms concerned (*Pseudomonas pyocyanea*, and *haemolytic streptococcus* and *staphylococcus*) are often resistant to penicillin, the routine use of streptomycin or chloromycetin is advisable. Inadequate control of the infection prior to operation results in infection of the operation wound and failure to obtain healing by first intention. The type of anaesthesia used will vary according to individual preference and the condition of the animal concerned. As a rule the author prefers the use of pentothal sodium for induction, while anaesthesia is maintained by nitrous oxide and oxygen, and ether if required.

Operative Technique

The technique of this flap operation mentioned by Leonard in 1947 is described as far as possible with the aid of the accompanying diagrams. Aseptic precautions having been carried out, the first step is to establish the ventral limit of the vertical part of the canal. This is done by exerting traction upon the external ear in order to minimise the coils of the rugae and by inserting a probe or director. By manipulating the director, the ventral limit of the canal can be determined externally. With experience this can easily be detected by palpation. About 1 to 2 cm. below the ventral limit of the canal a small incision (A-B) 1 to 2 cm. long is made through skin only, in a direction at right angles to the long axis of the canal. This having been performed, traction is again exerted upon the external ear by means of tissue or artery forceps applied to the lateral lip of the external orifice of the canal.

One blade of a pair of blunt-pointed scissors (*e.g.* Mayo scissors) is then inserted into the lumen of the canal and a cut made through skin, cartilage and integument at the antero-lateral and postero-lateral corners of the external orifice of the canal (Fig. 1). This procedure is designed to extirpate that cartilage which is not required for construction of a flap. The depth to which the incision should be carried can be determined by a sudden change in resistance to the scissors as they pass through the tragus and anti-tragus. These incisions having been made, there is often considerable haemorrhage. Depending upon the degree of haemorrhage this is controlled immediately, or after completion of the next stage when the bleeding points are more easily located. It is important in the smaller breeds that the above incisions should not be too large, for in these animals the removal of too much cartilage leaves insufficient for construction of the flap. In addition, the incisions should be as far apart as possible in order that the walls of the canal shall be adequately separated.

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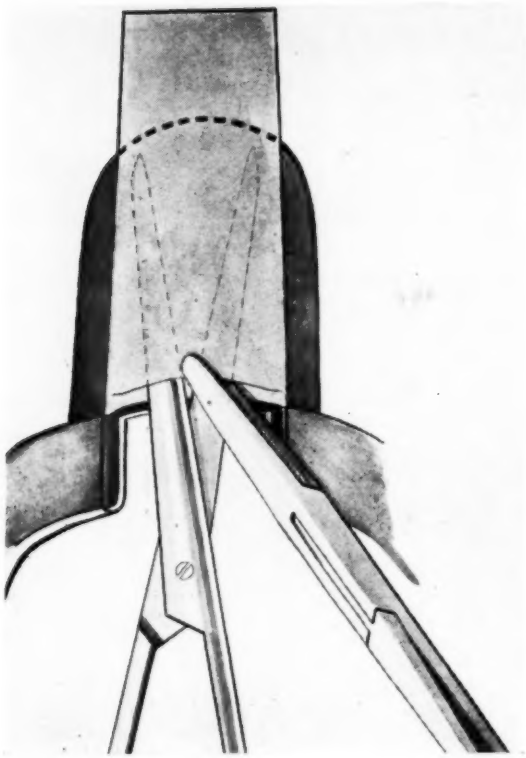

FIG. 1.—Grasping lateral wall of canal with forceps, cut through integument, cartilage and skin with scissors in the direction of the dotted lines.

In the next stage, the skin incisions made previously (Fig. 1) are continued (through skin only) so that they join each end of the small horizontal incision A-B) (Fig. 2). The base of the flap of cartilage isolated by the two incisions made with scissors is incised, commencing with the integument, then cartilage and subcutaneous tissue. The skin is not incised, but the entire area of skin isolated is dissected from the underlying connective tissue (Fig. 3), so that at this stage a rectangular area of skin has been removed from the lateral aspect of the canal along with a small section of cartilage and integument from the dorsal part of the lateral wall. The haemorrhage can now easily be controlled, compression or torsion is usually adequate for most cases, though a few may require ligation or cautery. Only the haemorrhage from vessels approximating the cartilage presents any difficulty.

The dorsal border of the remaining cartilage of the lateral wall of the canal is grasped with tissue forceps and gentle traction exerted. The connective tissue and the upper part of the parotid gland are freed from their attachments to the cartilaginous canal. It is unnecessary and, indeed, contraindicated to do much actual cutting of tissues. It is, however, an advantage to commence the separation by making a small incision in the connective tissue

†Errata - See p. 356

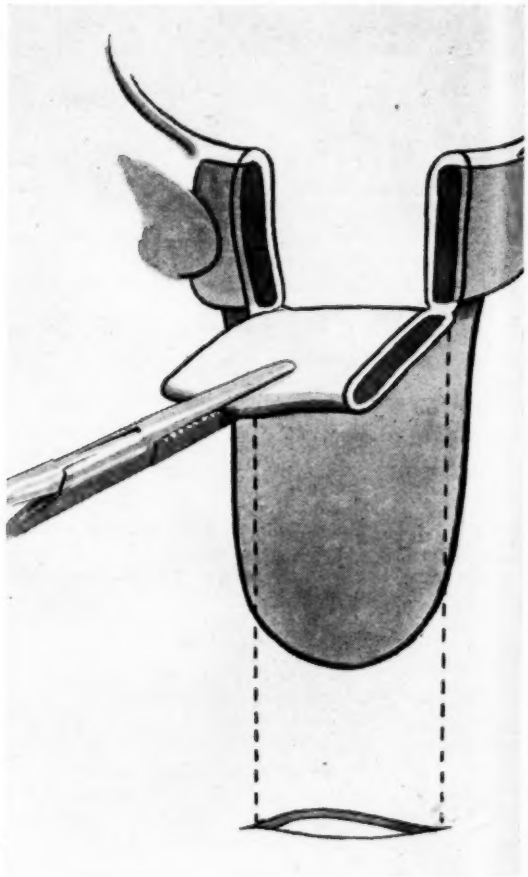

FIG. 2.—Continue *skin incision only* (see dotted lines) to meet incision.

(Fig. 4, Point A), a small pocket between the connective tissue and cartilage being formed. This having been done, a blunt-pointed pair of scissors is inserted into this pocket and the blades gently opened, thus separating the tissues by blunt dissection (Fig. 4). This procedure is repeated until the right angle turn in the canal towards the midline can easily be observed. It may be found necessary to incise fascial attachments both anteriorly and posteriorly at the dorsal limits of the canal. If adequate separation of the tissues has been achieved, it should be possible to depress the connective tissue and parotid gland, completely exposing the exterior of the lateral wall of the canal.

The next stage is the construction of a flap of cartilage to be reflected ventrally. This flap should be as wide as possible, especially at the base. Generally speaking, the flap should be no longer than twice the width of its base, otherwise the vascular supply of the tip is likely to be inadequate. There is a considerable tendency for the beginner to cut the flap narrower as the base is approached.

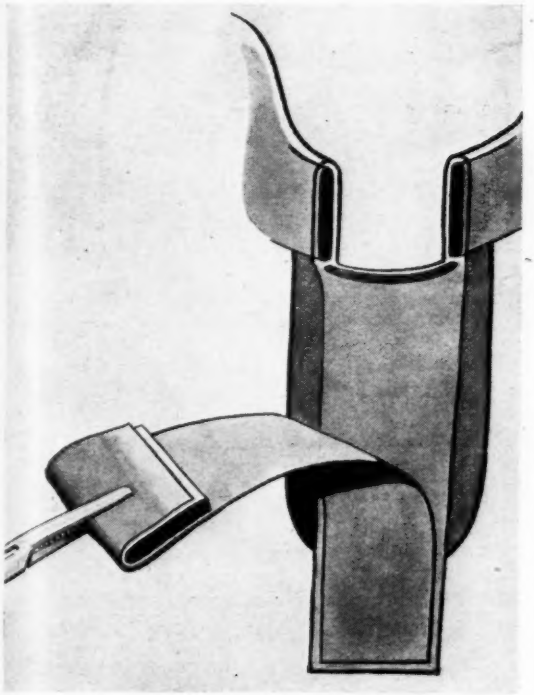

FIG. 3.—Reflect skin from connective tissue lateral to aural canal.

This difficulty can be overcome by using a pair of bowel forceps as a guide. One blade is inserted within the canal and one outside. The forceps are then clamped upon the piece of cartilage to be reflected. It is important that the forceps should be inserted to the full extent of the vertical portion of the canal. The flap is constructed by making two incisions parallel to the long axis of the canal and extending to the ventral limit of the canal. If bowel forceps are used then the incisions are made on either side of the blades of the forceps. It is most important to realise that it is only cartilage and integument which is incised. The connective tissue and parotid gland previously separated from the cartilage are depressed ventrally, and the flap drawn down over them. The incisions isolating the cartilaginous flap are best made with scissors, for a scalpel tends to follow the contour of the rugae, resulting in an irregular incision. These incisions having been made, the flap is drawn downwards over the depressed connective tissue and gland (Fig. 5). Two sutures are then inserted through the top of the flap at C. & D., thus anchoring it to the extremities of the original horizontal skin incision (A-B). It is essential that the flap be reflected sufficiently to provide complete drainage. Should the flap be found to be too long, then a small portion may be removed from the tip. As soon as any cartilage which protrudes beyond the cut edge of the integument has been excised, suturing is commenced. The skin is sutured to the cartilage and overlying integument with No. 3/0 polyester yarn using a curved cutting edge needle. Simple interrupted sutures are used.

Care should be taken to avoid overlapping of sutures in the region of the flap, for interference with its blood supply may result. Since post-operative reaction and swelling may develop, sutures should be loose. Special attention is required when suturing the angle at the base of the flap. Should this spot be overlooked, a small triangular area will remain which heals by granulation. Difficulty due to a kink in the suture line may also occasionally arise in this region in animals in which one of the rugae forms a prominent dorsal lip to the canal as it turns towards the midline.

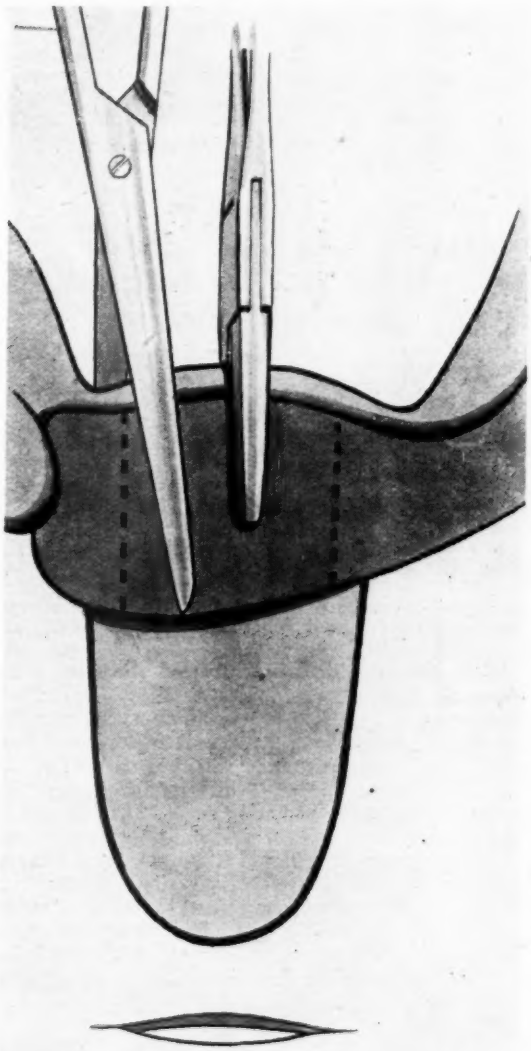

FIG. 4.—Commence the separation by making a small incision in the connective tissue.

+See Errata - p. 356.

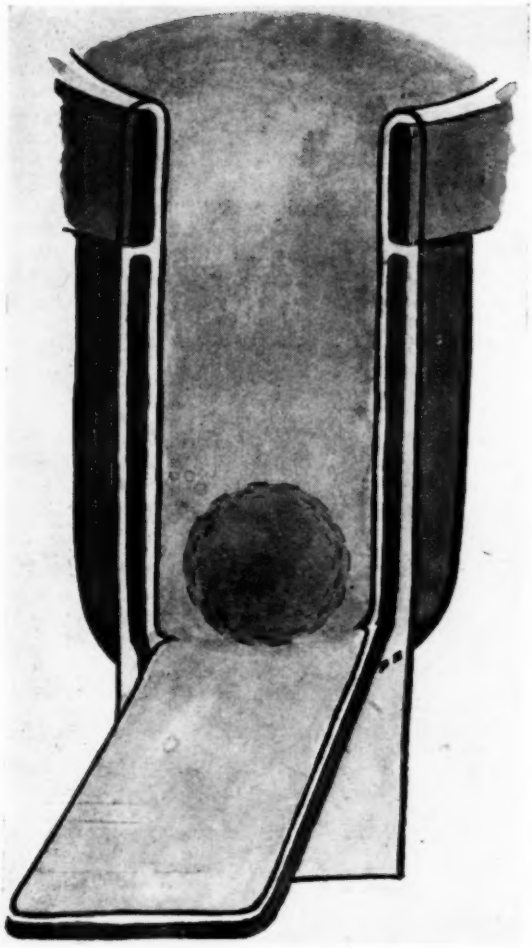

FIG. 5.—Flap of cartilage and integument reflected over depressed connective tissue.

The sutures having been placed (Fig. 6), some form of protective dressing is applied. The author prefers not to bandage but to suture a pad over the wound, removing it on the second or third day after operation. Undue irritation results if the pad is left on for a longer period. This pad overcomes the need of bandaging which is not without danger in the anaesthetised animal and which, when left on for any period, results in the accumulation of moisture around the operation site. Interference with the wound can be prevented by the application of an Elizabethan collar. The need for post-operative sedation and treatment with antibiotics will depend upon the case concerned.

Discussion

The advantages of the flap operation when compared with previous techniques have been described by Zepp (1949). Briefly, the ventral limit of the canal is exposed more accurately and more

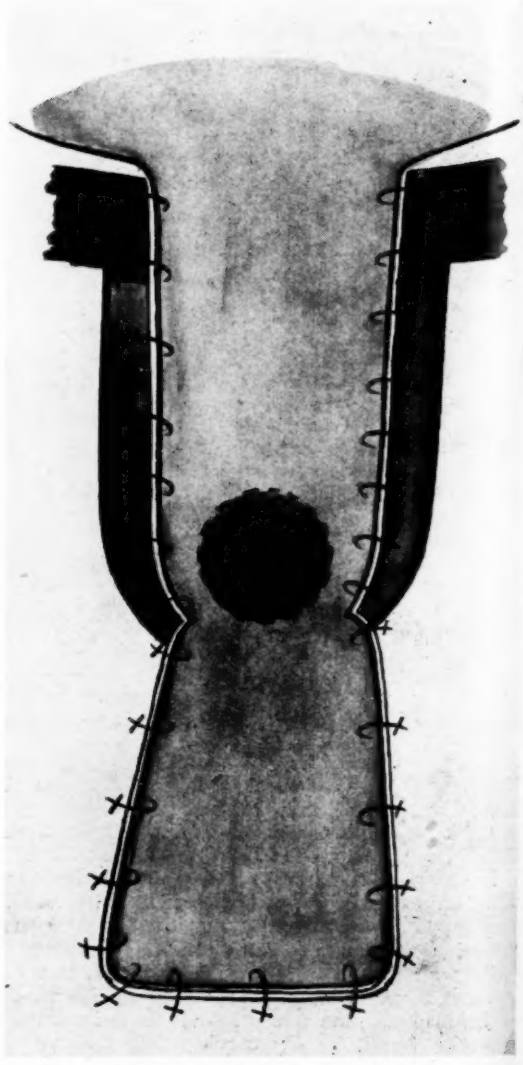

FIG. 6.—Cartilaginous flap sutured in position

adequately than in techniques in which a V-shaped incision is used. Secondary complete or partial occlusion of the canal, therefore, is less likely to occur at the base of the incision. In addition, the possibility of injury to the parotid gland and facial nerve is reduced to a minimum in this technique. The technique described varies only in minor details from that described by Zepp. As a result of experience of this operation over a period of six years, it is considered that the end result obtained is appreciably better than that seen after the use of previous techniques.

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An Emaciation Syndrome in Malayan Cattle

BY

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Veterinary Division, Department of Commerce and Industry, Singapore

Introduction

A NUMBER of animals among the heterozygous zebu dairy cattle found in Malaya are frequently observed to be in poor condition. Affected cattle progressively lose condition over a number of years, but may suffer periodic exacerbations and become emaciated and anaemic in only six months. An affected herd is characterised by decreased lactation yield, both in quantity and butter-fat content, and by high calf mortality. The natural outcome of such exacerbation is recovery or death, apparently dependent upon the nutritional level available. The actual cause of the exacerbation is not yet clear, but may be of virus origin.

An initial investigation was made in an affected herd during 1949 and 1950 and this indicated that dairy cattle subject to the low protein levels of the Malayan environment may, during their lives, develop a liver lesion similar to that described by Himsworth (1950) in nutritional diffuse hepatic fibrosis ! The investigation revealed also that the cattle were severely parasitised by the pancreatic fluke *Eurytrema pancreaticum*.

An Affected Cow.

Morbid Anatomy

At *post-mortem* each carcase showed advanced emaciation, anaemia, fatty friable liver and gross infestation of the pancreatic ducts with *E. pancreaticum*. No other findings were noted other than for migrating nematode larvae in the abdominal cavity and a minor helminth infestation of the digestive tract. Three livers and three pancreases were investigated pathologically.

Macroscopically, livers were friable and in colour paler than normal. The microscopical pathology varied from a diffuse fatty degeneration most marked around the central vein to, in one case, a severe diffuse fatty infiltration where every liver cell was distended by a large fat globule. In this liver the lesion was considered sufficiently severe to cause death or, if continued, to lead to liver cirrhosis. The condition of the livers was best described as " degenerative fatty infiltration."

Each pancreas was heavily infested with *E. pancreaticum*. The parasites were found in all the ducts other than those ducts whose lumen was too small for the parasites to enter. Macroscopically fibrosis around the larger ducts was noted, and microscopically there was hyperplasia of the lining epithelium of the larger ducts and marked inflammatory change. Around all but the smallest ducts there was fibrosis with a focal accumulation of chronic inflammatory cells. The degree to which the fibrosis had progressed varied. In general, the fibrosis of the organ had resulted in some glandular atrophy not sufficiently extensive to result in permanent pancreatic insufficiency. But, in one pancreas, fibrosis had advanced to such an extent that in some cases all that was left of a glandular lobule was three or four atrophied glands in a mass of fibrous tissue. In this latter animal it was considered that further normal pancreatic function was not possible. In all cases the Islets of Langerhans were unaffected.

Investigation

Microscopical examination of numerous wet blood films failed to demonstrate any parasitic blood infestation. Gland smears were not made. Similarly, faecal smears failed to demonstrate any heavy intestinal worm infestation. Blood analysis indicated that the emaciated animals were suffering from severe normocytic hypochromic anaemia. Serum calcium and phosphorus levels were found to fall within the physiological variations quoted by Dukes (1943). Heart blood, liver tissue, pancreatic secretion and *E. pancreaticum* taken at post-mortem and examined at the Veterinary Research Laboratory, Ipoh, were negative for bacteria, viruses, trypanosomes, filaria or rickettsiae.

Chemical analysis of the herbage to which the animals had access showed an adequacy of calcium, phosphorus, magnesium and potassium. The protein content of this herbage, however, was shown to be low. There was no deficiency of copper or cobalt. The following table summarises the analysis.

TABLE

Sample	*A. affinis* poor	*A. affinis* fair	*P. maximum* poor	*P. maximum* good
Per cent. ash	5·24	4·26	4·56	7·12
P_2O_5 on oven-dry basis	0·21	0·21	0·54	0·50
K_2O on oven-dry basis	1·53	1·09	0·65	1·73
CaO on oven-dry basis	0·23	0·30	0·48	0·50
MgO on oven-dry basis	0·19	0·41	0·23	0·20
Per cent. protein	1·89	2·10	2·31	3·64
Copper p.p.m. in ash	40	30	—	80
Cobalt p.p.m. in ash	—	—	—	2

The concentrate ration fed to the affected cattle was balanced in respect of calcium and phosphorus. Each animal in the affected herd was to receive 4–7 lb. of concentrates daily according to milk yield and 50–80 lb. of cut guinea grass (*Panicum maximum*). In practice,

however, although the concentrate ration was fully fed the animals often received no more than 25 lb. of cut guinea grass per head. There was, therefore, a serious deficiency of bulk in the ration and this probably accounted for the low butterfat content of the milk.

The clinical syndrome exhibited by the affected cattle in some respects resembled the early clinical features of aphosphorosis described by Green (1948). However, no evidence was found to suggest either an acalcicosis, an aphosphorosis nor any dysfunction of calcium or phosphorus metabolism. *Post-mortems* revealed no dental or skeletal lesions indicative of a calcium or phosphorus imbalance and the herd exhibited no clinical signs of hypocalcaemia or hypophosphataemia.

Similarly, there was no evidence to substantiate a deranged trace-element metabolism. Pasture analysis indicated a sufficiency of both copper and cobalt. Neither ataxia, regarded as the pathognomonic clinical sign of demyelination of the nerve fibres of the central nervous system and cerebrum (Dalling, 1944) nor diarrhoea, a characteristic clinical sign of Peat Scour in cattle grazing copper-deficient terrain in New Zealand (Cunningham, 1944, 1946) was observed. Myocardial atrophy associated with a replacement fibrosis, the cause of sudden deaths in West Australia was not found (Bennett & Underwood, 1949).

Discussion

The protein level of Malayan grazings is low. Thus, the percentage protein in a mixed sample of roadside grass is recorded as 2·7 per cent. protein (Gunn Lay Teck, 1951). Narrow-leafed carpet grass (*Axanopus affinis*) which forms a large part of the natural grazing has only 2·3 per cent. protein when cut at six weeks old. These figures compare unfavourably with average British meadow grass which has about 4 per cent. protein (Linton & Williamson, 1943). To supplement the low protein level of the natural grasses a more succulent type of grass such as guinea grass (*Panicum maximum*) has been introduced. However, the protein content of *P. maximum* does not rise above 4·5 per cent. protein when cut at one week old and contains only 2·4 per cent. protein when cut at six-week intervals. Further, if the guinea grass stools are not adequately fertilised and well managed growth is poor and protein content may fall below 2·3 per cent. protein.

The affected herd grazed on an *A. affinis* sward four hours in the morning and three hours in the afternoon ; about seven hours in all. The protein content of this natural grazing was shown by chemical analysis to be low (1·89 to 2·1 per cent. protein). Similarly, the protein content of the cut guinea grass fed was not high (varying between 2·31 and 3·64 per cent. protein). Additionally, the cattle often received only 25 lb. of cut guinea grass each daily. It appears, therefore, that this particular herd was short both of quantity and quality.

At each *post-mortem* examination two common factors were noted. First, fatty infiltration of the liver, and second, gross infestation of the pancreas with the fluke *E. pancreaticum*. These two findings may be of considerable importance when considered in conjunction with the fact that the herd was receiving a diet of inadequate herbage of low protein value supplemented by excess fat-rich concentrates. These findings associated with the chronic clinical syndrome exhibited by the cattle bear a close resemblance to nutritional diffuse hepatic fibrosis described by Himsworth in rats and which follows prolonged fatty infiltration of the liver.

Pancreatic excision, or prolonged fat-rich diet and a defective methionine-cystine balance within the body are three known causes of severe fatty infiltration of the liver. Chaikoff and Connor (1938) clearly demonstrated that excision of the pancreas in dogs produces fatty infiltration of the liver. These workers went on to show that this liver lesion was also produced in normal dogs maintained for long periods on fat-rich diets (Chaikoff, Connor, Eichorn, & Entenman, 1943). However, in the tropics, diffuse hepatic fibrosis in humans (the precursor of which is fatty infiltration of the liver) is correlated with poverty and thereby with malnutrition. In those cases the diet certainly contains no surplus fat and the conclusion is that the lesion follows an abnormal methionine-cystine ratio developing within the body. Under such conditions of malnutrition, it is postulated, cystine overpowers the supply of lipotrophic factors in the diet with the consequent onset of fatty infiltration (Himsworth & Glynn, 1944).

The possible significance of the severe pancreatic infestation in the affected stock is not clear. In view of the findings of Chaikoff and Connor in de-pancreatised dogs a correlation may exist between the pancreatic and hepatic lesions observed in all the affected cattle. It appears more probable, however, that the liver lesions were of nutritional origin. Similarly, little is known of the essential part played by certain amino acids in body metabolism, and it is not possible to assess the exact significance of methionine in the development of the clinical emaciation syndrome observed in Malayan cattle (Tucker & Eckstein, 1937 ; Loosli & Harris, 1945 ; Du Vigneaud, Cohn, Chandler, Schenk & Simmons, 1941 ; Block & Steckol, 1950).

Summary

An emaciation syndrome affecting crossbred zebu cattle in Malaya is recorded and the *post-mortem* findings are described. The similarity of aetiology, clinical syndrome and morbid anatomy to dietetic diffuse hepatic fibrosis described in rats, dogs and humans is discussed.

Acknowledgments.—I have to thank Dr. A. T. Marsden of the Institute of Medical Research for the pathological examination of liver and pancreatic tissues ; the Senior Veterinary Research Officer of the Malayan Veterinary Department, for help at two *post-mortems* and for bacteriological investigation ; Dr. Chapmen, Director, Chemara Central Research Station and the Senior Chemist (Soils), Malayan Agricultural Department, for carrying out the pasture analyses. I am indebted to the Director of Veterinary Services, Federation of Malaya for permission to publish this communication.

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(Continued at foot of col. 1, page 169)

Victoria Veterinary Benevolent Fund

A meeting of the Council of the Victoria Veterinary Benevolent Fund was held at 10, Red Lion Square, London, W.C.1, on January 7th, when the following members were present :—

Mr. H. W. Dawes (President) in the chair, Mr. E. P. Barrett, Professors T. J. Bosworth, R. E. Glover, R. Lovell, J. McCunn, L. P. Pugh, Mr. J. N. Ritchie, and Professor W. L. Weipers. Mr. C. W. Francis, Secretary, was in attendance.

Minutes

The Minutes of the previous meeting held on October 8th, 1954, having been published were taken as read and signed as correct.

Apologies for Absence

Apologies for absence were received from Major J. J. Dunlop, Mrs. D. I. Glover, Messrs. L. E. Hughes, G. P. Male, Professor W. M. Mitchell, Capt. T. M. Mitchell, Professor P. E. Mullaney, Dr. R. F. Montgomerie, Professor C. W. Ottaway, Mr. A. Spicer, Major H. Sumner, Major C. W. Townsend, Capt. Wm. Watt, Capt. A. Whicher, Professor G. H. Wooldridge, Dr. W. R. Wooldridge and Major W. H. Wortley.

Correspondence

The Secretary reported :—

(*a*) A letter dated October 18th, 1954, from Messrs. Robertson, Dempster & Co., Solicitors, informing the Council that the late Mr. Peter Conacher, who died in South Africa on September 16th, 1954, had bequeathed the sum of £1,000 to the Fund.

(*b*) That the Royal Counties Veterinary Medical Association had nominated Professor T. J. Bosworth, M.A., B.SC., M.R.C.V.S., D.V.S.M., to succeed Mr. H. Bell, M.R.C.V.S., as their representative on the Council as from November 30th, 1954.

Hunting Trust

As Secretary to the Trustees, Mr. Francis reported, for the information of Council, that the Trustees had been advised that the Northern Petroleum Tank Steamship Co., Ltd. had allotted the following fully paid bonus Shares to the Trust : 13,800 5s. Ordinary Shares, 1,725 £1 6 per cent. Non-cumulative Preference Shares and that appropriate Share Certificates would be issued on February 15th.

Investments

The Treasurer reported that he had authorised the balance standing in the Donations Account on December 24th, 1954, amounting to £272 19s. 10d., to be invested in the purchase of £307 18s. 4d., 3½ per cent. Conversion Stock. It was agreed that the Treasurer's action be approved.

Accountant's Report

The Secretary read the following report which was approved, a vote of thanks being accorded to the respective donors :—

Since the previous meeting the following subscriptions and donations have been received :—

	£ s. d.	£ s. d.
Subscriptions		
Southern Counties Veterinary Society	7 7 0	
Western Counties Veterinary Assoc.	2 2 0	
		9 9 0
Donations		
Anonymous	5 5 0	
Association of State Veterinary Officers	5 5 0	
B.V.A. Golf Tournament—Torquay	4 5 0	
R.V.C. Students' " Cake " raffle ...	1 14 6	
Dayus, Mr. and Mrs. C.V.	2 2 0	
Lancs Veterinary Society	10 0 0	
Murray, Miss B. M. (Ladies Kennel Association Show)	5 5 0	
North of Ireland V.M.A. (raffle at dance)	12 0 0	
West of Scotland Division	10 0 0	
Whicher, A.	10 6	
		56 7 0
Collecting Boxes		
Beckett, R. L.	1 15 0	
Brancker, Miss W. M.	1 17 0	
Central Veterinary Society	5 12 0	
Chambers, F.	2 10 0	
Eastern Counties Veterinary Society	5 14 0	
East Midlands Division	3 5 0	
Essex Veterinary Society	3 11 6	
Furniss, R. H.	1 17 6	
Gillmor, H.	1 1 0	
Herts and Beds Veterinary Society	6 12 0	
Hewer, Spriggs and Wilson	1 10 0	
Hopson, C. G.	6 0 0	
Lincs and District Division ...	6 11 9	
Midland Counties Veterinary Assoc.	4 18 3	
Mid-West Veterinary Association ...	6 10 0	
Morton, J. T.	18 6	
North of England Veterinary Medical Association	3 15 3	
North of Scotland Division	6 1 0	
North Wales Division	2 18 6	
Pasfield, J.	1 1 0	
Royal Counties Veterinary Society ...	6 6 0	
Russell, Miss E. E. B.	1 18 0	
Scottish Branch, B.V.A.	3 19 9	
Scottish Metropolitan Division ...	3 9 4	
Shipley and Low	1 7 0	
Southern Counties Division	7 16 4	
South Eastern Veterinary Association	11 10 0	
West of Scotland Division	6 0 11	
Western Counties Veterinary Assoc.	14 2 0	
White, J. B.	1 1 0	
Wortley, W. H.	18 6	
Yorkshire Veterinary Society ...	10 17 6	
		143 5 7
		£209 1 7

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The Secretary also reported that five members had been good enough to sign a second deed of covenant in respect of their annual subscriptions, to become operative as from January 1st, 1955.

Christmas Gifts

The Secretary reported :—

(*a*) That the appeal by the Executive Committee in THE VETERINARY RECORD in December produced the gratifying sum of £65 12s. 6d.

(*b*) That the Executive Committee in collaboration with the Treasurer of the V.V.B.F.Ladies' Guild had distributed early in December grants for amounts ranging from £6 to £10 to 34 recipients ; and that a lady member of the profession had personally delivered a bird to one of the Fund's recipients living in the neighbourhood.

Many letters from the beneficiaries expressing their thanks for these unexpected gifts were read by the members of Council, and it was agreed that these should be passed to the Ladies' Guild so that their members might know how much their good work was appreciated.

Cases

No. 298. Widow, age 27. One child, age two. A letter dated November 28th, 1954, from this recipient was read which intimated that she no longer required assistance from the Fund as she had recently remarried. The Secretary reported that the grant was accordingly cancelled.

No. 301. M.R.C.V.S., age 56. Seriously ill. Three children, one son, age 20, and two daughters, ages 23 and 18. At the request of the President, Professor H. G. Lamont attended the meeting to give full details of this case and to assist the Council in its deliberations. The Members expressed much regret at this member's serious illness and after prolonged discussion it was agreed that the Fund should assist the family by giving a grant to the son's and youngest daughter's educational fees. It was Thereupon Resolved—

That an allowance at the rate of £4 per week be made in this case for 12 months, commencing from January 1st, 1955, after which period the grant be reviewed.

No. 302. Widow, age 60. The Treasurer informed the meeting he had just received a letter from this widow asking if the Fund could help her with a small grant. It was agreed that the matter be left in the hands of the Executive Committee with power to act.

Date of Next Meeting

It was decided that the date of the next meeting be left in the hands of the Officers of the Fund.

In Parliament

Bird Protection, England and Wales (Advisory Committee)

Mr. Janner (February 18th) asked the Secretary of State for the Home Department the scientific qualifications of each member of the Bird Protection Advisory Committee.

Lady Tweedsmuir asked the Secretary of State for the Home Department who are the members of the Advisory Committee appointed under the Protection of Birds Act, 1954.

Major Lloyd-George : The members of the Advisory Committee on the Protection of Birds for England and Wales are as follows:

Sir A. Landsborough Thomson, C.B., O.B.E., Miss P. Barclay-Smith, Mr. P. E. Brown, my hon. and gallant Friend the Member for East Grinstead, Mr. J. M. Craster, Mr. James Fisher, Mr. William Foster, Mr. Nigel Laing, Captain S. T. A. Livingstone-Learmonth, Mr. G. R. Mountfort, Mr. E. M. Nicholson, C.B., Major General A. G. O'Carroll-Scott, C.B., C.B.E., Mr. Peter Scott, C.B.E., D.S.C., and Mr. H. N. Southern.

The committee includes members able to speak for the point of view of sportsmen, landowners, farmers, fisheries, and local authorities, as well as ornithologists, and in appointing them I had regard to relevant knowledge and experience rather than to specific scientific qualifications. But the Chairman is a scientist and ornithologist of distinction, and the members include the Director-General of the Nature Conservancy, a senior ornithologist of the Oxford University Bureau of Animal Population, the Honorary Director of the Wildfowl Trust, and other leading ornithologists.

Tuberculosis Eradication Areas

Mr. Hurd (February 10th) asked the Minister of Agriculture what plans are being made to establish an attested area clear of bovine tuberculosis in Berkshire, Hampshire, Surrey, West Sussex, and the Isle of Wight; and when the first steps will be taken.

Mr. Amory : Preliminary discussions have recently taken place about the next areas to be dealt with under the Tuberculosis Area Eradication Plan. The proposal as regards the five counties mentioned by my hon. Friend is to provide free tuberculin tests from March 1st, 1955, in the expectation that these areas may be declared eradication areas two years later and subsequently attested areas. I hope to be able to announce the details very soon.

POST-GRADUATE SCHOLARSHIPS

The Ministry of Agriculture and Fisheries and the Department of Agriculture for Scotland propose to award a limited number of post-graduate scholarships in Agricultural Economics, Husbandry, Statistics and Agricultural and Dairy Engineering for the academic year beginning October 1st, 1955. The closing date for applications is March 31st, 1955.

Further particulars can be obtained from the Secretary, Ministry of Agriculture and Fisheries (Research Branch), 1-4, Cambridge Terrace, Regent's Park, London, N.W.1, or the Secretary, Department of Agriculture for Scotland, St. Andrew's House, Edinburgh, 1.

Applicants resident in Northern Ireland should apply to the Ministry of Agriculture and Fisheries at the above address.

Current Literature

DIGEST

Nervous Diseases and the Value of ACTH and Vitamin B 12

Reports are quoted by Bunce, which indicate that the administration of ACTH, in contrast to cortisone, lessens the sensitivity of the brain to irritation, and thereby reduces the severity of the symptoms which result from disorders of the central nervous system. ACTH was used in combination with vitamin B. 12, which is also considered to have a beneficial effect upon certain nervous diseases, on a wide range of canine ailments, mainly of the nervous type. These two compounds were combined so that 30 units of ACTH and 1,000 micrograms of vitamin B 12 were contained in one c.c., which represents the dose for injection to dogs of the weight range of 10 to 15 lb. This treatment was repeated daily for 2 to 14 days. The response to the injections was reported to be good in cases of encephalitis, particularly when associated with the distemper syndrome.

Pyometra in the Bitch

Veterinary Medicine, **49** (12) has published a series of papers on the cause, diagnosis, and treatment of pyometra in the bitch. Low reviews the aetiology of the disease, and concluded that it was usually the result of endocrine imbalance, and not a sequel to the penetration of infection through the cervix. He emphasised the importance of the history of such cases in making a diagnosis, and observed that irregularities in the oestrus cycle are a frequent prelude to pyometra. An interstitial nephritis is not an uncommon complication to pyometra, and an appraisal of renal function is advised when considering the treatment and prognosis. Ovariohysterectomy is the recommended treatment for pyometra. The operation technique is described by Armistead, who prefers an abdominal midline incision, extending from the anterior brim of the pubis to the umbilicus, as the hazard of rupture of the uterus is increased if its removal is attempted through too small an incision. Armistead suggests that the safest way to bring a distended uterus through the abdominal opening is by the manual application of pressure on the abdomen from behind the last rib. The treatment of shock after operation is discussed by Bild, who considers that micturition by the bitch shortly following the operation is a good sign, because animals in shock do not produce urine. Where shock is likely to occur a blood transfusion of 8 c.c. per pound bodyweight is advised, supplemented by 10 to 15 c.c. of Ringer's solution, reinforced by ascorbic acid (1,000 mg. per litre), and 10 per cent. calcium gluconate (2 to 5 c.c. per litre).

Carrying large syringes

A request for advice on how to carry large syringes by a veterinary surgeon with a country practice brought the following response. Syringes of 10 c.c. and over can be safely and cleanly transported rolled in linen towels, 12 by 20 inches in size. The ends of the towel are wrapped into the roll, and this package, which can be autoclaved if desired, may be carried in a plastic bag. (Ferguson.)

A device for small animal restraint

An ingenious device for the immobilisation of small animals is described in a paper by Banks. The apparatus consists of a rubber bag, shaped like the letter B, and filled with small plastic granules. The rubber bag is attached by tubing to a foot vacuum pump. The partial evacuation of air from the bag apparently causes the granule mass inside the bag to acquire the consistency of "putty" which allows the bag to be moulded around a limb, or appropriate part of the patient, for which restraint is required. When the position of the bag has been adjusted, the exhaustion of the remaining air causes the granule mass to form a "solid, rock-like mass," thereby effecting restraint without causing the animal discomfort. It is assumed that this action is achieved by the external air pressure forcing the rubber covering, which forms the bag, on to the granule mass, although it is difficult from the description given to ascertain the precise *modus operandi* of the apparatus. This device, which is descriptively, but inaccurately, called a "quick freeze" immobilizer, was found to be useful for minor surgery, physical examinations, and X-ray work. D. W. J.

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SPECIAL LECTURES

As announced in our issue of January 22nd, Professor Nils Lagerlöf, of the Royal Veterinary College of Sweden, Stockholm, will be giving a course of two lectures on "Some Infertility Factors in Domestic Animals," at the Royal Veterinary College, London, at 4 p.m., on March 3rd and 4th. At the first lecture the Chair will be taken by Mr. G. N. Gould, J.P., and at the second lecture the Chair will be taken by Professor H. Burrow, of the Department of Medicine, Royal Veterinary College, London.

Professor Lagerlöf has also agreed to address a general meeting of the Society for the Study of Animal Breeding at the Wellcome Research Institute, 183-193, Euston Road, London, N.W.1, on Wednesday, March 2nd. The subject of his paper will be "Poor Serving Ability in Farm Animals (Bulls, Stallions, and Boars)" and the discussion will be opened by Dr. J. L. Hancock, of the Agricultural Research Council, Cambridge. Members of the profession are cordially invited to attend.

News and Comment

NATIONAL SERVICE AND VETERINARIANS ABROAD

The Ministry of Labour and National Service has assured the Association that, should the new National Service Bill be enacted, there is no intention of applying the new provisions to men who have gone abroad to take up employment in the Colonial Service, including the Colonial Veterinary Service, where deferment has already been granted by this Ministry. Men accepting appointments in the Colonial Veterinary Service will be treated in the same way as they are at present; that is, providing they remain in the Service until they are 26 years of age, they will be regarded as no longer being liable for National Service.

THE B.R.X. CLUB

The Annual Dinner of the B.R.X. Club is to be held at the Royal Veterinary College on Saturday, April 2nd. Professor G. H. Wooldridge will be the guest of honour, and the President, Professor C. W. Ottaway, will be in the Chair. Members should receive their formal invitations with reply slips by the end of February. Anyone who has been missed out and who wishes to attend the dinner should write direct to the Secretary—Mr. A. S. King, Hon. Sec., B.R.X. Club, Department of Veterinary Anatomy, The University, Bristol, 8.

UNIVERSITY OF LIVERPOOL FACULTY OF VETERINARY SCIENCE

Mr. L. Arnall, B.V.SC., M.R.C.V.S., has been appointed Demonstrator in small-animal medicine and surgery.

PERSONAL

Births

CAWTHORNE.—On February 16th, 1955, to Cecilia Ann, wife of W. N. Cawthorne, M.R.C.V.S., of Hillcrest, South Street, Midhurst, Sussex, a daughter, Mary Louise.

MEARS.—On February 16th, 1955, to Wendy, wife of R. H. Mears, M.R.C.V.S., of Horsham, Sussex, a daughter, Sarah Elizabeth.

COMING EVENTS

March

2nd (Wed.). Annual General Meeting of the Lancashire Division, B.V.A., in the Veterinary Hospital, University of Liverpool, 2.30 p.m.

Ordinary General Meeting of the Society for the Study of Animal Breeding, at the Wellcome Research Institute, 183-193 Euston Road, London, N.W.1, 11.30 a.m.

3rd (Thurs.). General Meeting of the Central Division, B.V.A., at the Royal Veterinary College, Camden Town, London, N.W.1, 5.30 p.m.

4th (Fri.). Annual General Meeting of the Royal Counties Division, B.V.A., in the New Letters Lecture Theatre, Reading University, 2.30 p.m.

8th (Tues.). Annual General Meeting of the East Midlands Division, B.V.A., at the School of Agriculture, Sutton Bonington, 2.15 p.m.

9th (Wed.). Ordinary Meeting of the A.V.T. and R.W.'s (Northern Region) in the Veterinary Hospital, Pembroke Gardens, Liverpool 3, 2 p.m.

10th (Thurs.). Joint Meeting of the Sussex Division, B.V.A., and the Brighton Division of the B.M.A., at the Hotel Metropole, Brighton, 6.45 p.m.

11th (Fri.). Ordinary Meeting of the North Wales Division, B.V.A., at the Voelas Arms Hotel, Pentrevoelas, 2 p.m.

General Meeting of the Society of Women Veterinary Surgeons, at the Veterinary Laboratory, Ministry of Agriculture, New Haw, Weybridge, Surrey, 11 a.m.

16th (Wed.). Joint Meeting of the Sections of Comparative Medicine and Pathology at the Royal Society's House, 5 p.m.

18th (Fri.). Special Meeting of the Mid-West Division, B.V.A., at the Berkeley Café, 3 p.m.

25th (Fri.). Annual General Meeting of the South Wales Division, B.V.A., at Carmarthen.

April

30th (Sat.). Association of State Veterinary Officers Annual General Meeting and Dinner in London.

May

6th (Fri.). Royal Veterinary College 163rd Annual Ball at the Hyde Park Hotel.

June

10th (Fri.). Annual Dinner of the R.A.V.C. Officers' Club, at Grosvenor House, Park Lane, London.

September

4th to 10th. 73rd Annual General Meeting and Congress of the British Veterinary Association at Belfast.

APRIL MEETINGS OF COUNCIL AND COMMITTEES, B.V.A., IN EDINBURGH

AT THE ROYAL (DICK) SCHOOL OF VETERINARY STUDIES

Monday, April 4th.—

10.15 a.m. Veterinary State Medicine Committee.
2 p.m. Home Appointments Committee.
4 p.m. Organising Committee.

Tuesday, April 5th.—

10.15 a.m. Parliamentary & Public Relations Committee.

11.30 a.m. Finance Sub-committee.
2 p.m. General Purposes & Finance Committee.

Wednesday, April 6th.—
10.30 a.m. COUNCIL MEETING.

ADDRESSES OF DISEASE-INFECTED PREMISES

The list given below indicates, first, the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax

Ayr. Crummack House, Beith (Feb. 12).
Cumberland. Lesson Hall, Wigton (Feb. 14).
Lancs. Park Hall Farm, Charnock Richard, Chorley (Feb. 11).
Leics. Stoughton Lodge Farm, Stoughton (Feb. 11).
Lincs. Jesmond Farm, Tealby (Feb. 12).
Yorks. Fremmington Mill Farm, Fremmington, Reeth, Richmond (Feb. 12); Aldmoor Farm, Burythorpe Malton; Union House Farm, Skeeby, Richmond; Low Whita, Low Row, Richmond; The Haven Farm, South Anston, Sheffield (Feb. 14).

Fowl Pest

Cambs. Fendyke Farm, Emneth, Wisbech (Feb. 11).
Derby. Hill Top, Scarcliffe, Chesterfield (Feb. 11).
Glouc.s. Shardlow, North Road, The Reddings, Cheltenham (Feb. 13).
Herts. Herts Institute of Agriculture, St. Albans (Feb. 12).
Lincs. Hurn Farm, Billingborough, Sleaford; Malting House, Grosvenor Road, Billingborough (Feb. 12).
Surrey. Brookfield, Frog Grove Lane, Wood Street, Guildford (Feb. 13).

Swine Fever

Bucks. Sandpits Field Farm, Station Road, Castlethorpe, Wolverton (Feb. 19).
Ches. Lower Hall, Norbury, Nantwich (Feb. 15); Ridley Green Farm, Ridley, Nr. Tarporley (Feb. 18); Leighton Grange Farm, Leighton, Nr. Crewe; Woolfall Farm, Hankelow, Crewe (Feb. 21).
Essex. Battleswick Farm, Rowhedge Road, Colchester (Feb. 18); Church Farm, Alresford (Feb. 21).
Flints. Crofts Bank, Iscoed, Whitchurch (Feb. 18); Park Lea Dairies, Iscoed (Feb. 21).
Herts. Castlebury Farm, Wareside, Ware (Feb. 16); Rectory Farm, Little Chishill, Nr. Royston (Feb. 21).
Lancs. Peartree Farm, Clifton, Nr. Preston (Feb. 16); Woodside Farm, Inskip, Preston (Feb. 17).
Leics. Home Farm, Staunton Harold, Ashby-de-la-Zouch (Feb. 21).
Norfolk. Station Road, Aldburgh, Harleston (Feb. 21).
Oxford. Elmsfield Farm, Chipping Norton; Bankside, Shutford, Banbury; Pool Farm, Balscote, Nr. Banbury (Feb. 15).
Salop. Frankton Hall, Welsh Frankton, Whittington, Oswestry (Feb. 16); The Nursery, Bicton Heath, Shrewsbury; Llwynygroes, Llanymynech (Feb. 18); Lower House, Cardeston, Shrewsbury, Rose Hill Farm, Rose Hill, Nr. Market Drayton (Feb. 21).
Staffs. Church Farm, Talke, Stoke-on-Trent; 12, Mill Lane, Short Heath, Willenhall (Feb. 17).
Warwicks. Hawkes Barn Cottages, Heathcote (Feb. 21).
Worcs. Ipsley Mill Farm, Ipsley, Redditch (Feb. 21).
Yorks. Old Mill, Dansome Lane, Hull (Feb. 15); Derwent Cottage Farm, North Duffield (Feb. 18).

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

MYXOMATOSIS

Sir,—It is extremely interesting that Mr. F. B. Edwards in his letter in your issue of January 29th, should have described symptoms of nicotinic acid deficiency in farm dogs no longer capable of securing for themselves rabbits to supplement the deficient diet he describes. It so happens that the flesh of the wild rabbit has been used as part of the standard diet that we have employed in this laboratory over the past three years in collaborative studies with C. E. Waterhouse and H. Partington on the vitamin requirements of the dog. We find that the nicotinic acid content of rabbit flesh is about 35 μg. per gramme (or about 1 mg. per ounce), even after pressure cooking, so that even at the high figure of 1 mg. nicotinic acid per 10 lb. bodyweight cited by McCay (1949) as the daily requirement of the dog, a few ounces of rabbit flesh should amply provide the quantity required. Since dogs are likely to behave in these circumstances in the manner described for wild carnivores by Morgan (1941), and to consume other parts of the carcase, one rabbit is likely to provide several times the daily nicotinic acid requirement, even on a high-maize diet. It is, however, surely desirable to recommend amendments to this unsatisfactory diet described by Mr. Edwards (and also in detail for sheep dogs by Greig, 1953), or to advocate the regular provision of the missing factor(s), and not to rely upon fortuitous supplementation in the form of "the occasional rabbit."

Some of the other points raised by Mr. Edwards would appear to be met in the paper by Ritchie, Hudson & Thompson, delivered to the B.V.A. Congress at Torquay and in the Second Report of the Advisory Committee on Myxomatosis recently published. His humanitarian attitude naturally commands sympathy, but as one who has had the privilege of undertaking research both on the effects of gin-trapping and, to a limited extent, on the transference of myxomatosis, I find it difficult to escape the conclusion that considerably more pain and suffering are caused to the rabbits themselves by trapping than by the disease. If willingness to eat and to mate are any criterion of freedom from suffering, then many rabbits must be

relatively unaffected in this respect until the late stages of myxomatosis. The suffering caused by the gin trap, however, is unquestionable, and the study of trapped rabbits has formed one of the most unpleasant investigations in which I have ever participated.

According to all reliable evidence, it appears that although the rabbit was present here in earlier times, it died out and was absent for many centuries prior to its reintroduction during the Norman period. From results of research that we conducted from the University College of Wales, Aberystwyth, it appeared extremely probable that the practice of commercial trapping, far from limiting the spread of the rabbit population, favoured this considerably, and at the same time caused a significant diminution in the population of such predators as the fox and stoat (Phillips, Stevens & Worden, 1952). The rabbit has in fact been exploited commercially in some areas to a very marked degree, with effects on agriculture that may be observed, for example, over large parts of Pembrokeshire. Mr. Edwards queries the degree of damage actually inflicted by the rabbit population, but apart from practical observations we have obtained adequate experimental proof of the harm which the rabbit is capable of inflicting (Phillips, 1953; Church, Jacob & Thompson, 1953).

The long-term effects of myxomatosis on the rabbit population and on the "balance of nature" remain to be seen, but as we have already observed with marked populations, the rabbit is capable of building up its numbers extremely rapidly following heavy losses (Phillips, 1955). Unless the European rabbit fails to strike a balance with myxomatosis, and to survive on the same terms with the virus as, *e.g.*, the native wild rabbits of Brazil (*Sylvilagus brasiliensis*), it is likely to remain a highly successful species, and to continue to spread in the way envisaged by Charles Elton (1939) when he wrote: "The growing speed and the capacity of transport is breaking down the faunal individuality of continents and islands, formed very slowly through the eras of geological time. Wallace's zoo-geographical realms are beginning to disappear and to be gradually replaced by the common world fauna consisting of those species that have the highest ecological competitive powers."

Various aspects of ecology, control and damage will be discussed in detail in a forthcoming joint monograph, but for present purposes it should be emphasised that in Great Britain the rabbit ranks as a major agricultural pest and has proved capable of damage to pastures and crops far outweighing its own contribution to the national dietary, and that whatever potential trapping may have as a means of population control, the use made of it for commercial purposes has not lowered rabbit numbers but probably resulted in their increase. Whether the rabbit populations in areas affected by myxomatosis recover or not, there is bound to be a period of readjustment in dependent, related or competitive species, but as the Advisory Committee has indicated, the attempts by man to help or hinder the spread of the disease are likely to have little effect. The statement of this Committee that " . . . whatever the motive, we deprecate any attempt to preserve the wild rabbit population in this country" appears fully justified in the light of all the information available, and it is to be hoped that "serious minded landowners and their veterinary surgeons" will refrain from acting to the contrary in the manner suggested by Mr. Edwards.

Yours faithfully,
ALASTAIR N. WORDEN.

Cromwell House,
Huntingdon.

February 12th, 1955.

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A LEGITIMATE GRIEVANCE

Sir,—I consider the letter of J. A. Douch to be a great reflection on the veterinary profession. There is no body of men in this country other than the medicos who work longer hours than we do and to rush into print with one isolated example carries no weight whatsoever. Here is the other side of the argument. The opening hours of the local clinic in Luton are: 9.30 a.m. to 1 p.m., 2 p.m. to 6 p.m. daily, except Saturday 9.30 a.m. to 12.30 p.m. only.

I wonder what Mr. Douch would have done with his puppy had it been taken ill at 12.45 midday on Saturday!

My experience here in this town is that 90 per cent. of the small-animal calls in the evenings, at weekends and all bank holidays, are from owners who normally visit these clinics but who are perfectly prepared to pay a fee and make use of the local veterinary surgeon when the clinic is closed.

No wonder small-animal practitioners get exasperated, and who can blame them if they choose to live away from their surgeries. What is sauce for the goose is sauce for the gander.

Yours faithfully,
C. R. A. POWELL.

1, Brook Street,
New Bedford Road,
Luton.

February 15th, 1955.

INTRAVENOUS INJECTION OF SUCCINYLDICHOLINE CHLORIDE

Sir,—I should like to report briefly on observations made in horses following the rapid (3 to 10 seconds) intravenous injection of succinyl-dicholine chloride. Administration of doses of 0.08 mg. per kg. to 1 mg. per kg. produce a transient period of muscle twitching, followed by collapse in some 20 to 30 seconds. After "going down," there is a variable

period of muscle paralysis, which lasts for 2½ to 10 minutes, depending on the dose. Apnea of brief duration (½ to 2½ minutes) accompanies doses up to 0.2 mg. per kg., but at no time did this temporary lack of pulmonary ventilation appear to produce cyanosis or other untoward symptoms. With these therapeutic doses, respiration always returned spontaneously. There is an initial period of hyperpnea before returning to a normal rate and depth. Larger doses may produce an alarming apnea and death from asphyxia, which is preventable by artificial respiration. During a prolonged apnea, there are concurrent abnormalities in the electrocardiogram.

Recovery from the drug is rapid, usually taking 4 to 10 minutes. One observes that the muscles of the tail recover first, followed by minor leg and head movements. Next the animal rises to its sternum, and then stands up, showing no evidence of ataxia, excitement or muscle weakness.

In trials involving over 30 horses, the drug has been used successfully as a restraint measure: (1) for minor procedures on fractious animals, (2) prior to local anaesthetic infiltration and (3) prior to the administration of general anaesthetic solutions. Casting harness or ropes are unnecessary. We have experienced no deaths in horses until doses in the neighbourhood of 0.5 to 1 mg. per kg. are used, and these could have been prevented by artificial respiration. Under no circumstances should the drug be used in cattle, unless adequate means are at hand to breath the animal.

Succinyl-choline seems to exert a decamethonium-like action at the myoneural junction of skeletal muscle, causing an initial depolarisation followed by profound relaxation. Since the drug is readily hydrolysed by plasma cholinesterase, species having a high plasma enzyme activity, such as the equine, seem to metabolise the drug rapidly. Conversely, species having a low plasma cholinesterase activity, such as the bovine, show a marked degree of susceptibility. Actually, the effective dose in cattle is approximately one-tenth that in horses, and the margin of safety appears to be very narrow.

The general conclusion is that succinyl-choline offers a safe and practical restraint measure that has a potentially wide field of use in equine practice. However, since it is better to be conservative regarding the clinical uses of a new and somewhat spectacular procedure, it probably would be preferable to limit current use of the drug to research establishments until a larger volume of experimental data can be accumulated. Such information can then be used to answer the question of future applicability.

Yours faithfully,

CLARENCE M. STOWE,
Instructor, Division of Veterinary Physiology and Pharmacology,
University of Minnesota,
Institute of Agriculture,
School of Veterinary Medicine,
St. Paul 1, Minnesota, U.S.A.

February 9th, 1955.

THE SCHEME FOR ANIMAL NURSES

Sir,—May I add support to Mr. Steward's letter in THE VETERINARY RECORD of February 12th?

It is quite possible that those of us fortunate enough to be able to attend Divisional Meetings of the B.V.A., may vote on this scheme, without having given much thought to the details as given in the SUPPLEMENT to THE VETERINARY RECORD, October 30th, 1954. Further, should this scheme be accepted, the persons most likely to be affected by it will be those least likely to be given the opportunity to vote, *i.e.*, those recently qualified. They do not find it easy to attend Divisional Meetings.

One is ever mindful of the fact, given in this SUPPLEMENT, that the Champion's Committee in recommending that no further licences be issued by the Ministry, had in mind the suggestion of the R.C.V.S. (given in evidence) that the use of lay help in nursing duties would give more effective use of professional manpower. This sounds as if the scheme is a certainty before we have a chance to discuss it.

Promoters of this scheme say "That these trained people would carry out duties which at present, for lack of lay help, are carried out by veterinary surgeons." Well, we hear lots of groans about the shortage of assistants but never about the lack of lay help. That lack does not exist.

We may wonder what work are these trained nurses to do? We are told they will:—

(1) "Assist in surgeries—controlling animals, carry out simple dressings."

To me that shows a complete lack of knowledge of small-animal practice. Most animals can be controlled by their owners and, most important, it is well to remember that small-animal practice is a very, very personal affair. If the owner of an animal decides that you are the person to treat his pet, then he likes to see you making a fuss of it. Whether you like it or not the animal's complaint is a very confidential matter between you and the owner. In time you are given the credit of understanding the animal, and you might even be persuaded to think the animal is used to your routine. The owner certainly does not like anyone else handling his pet.

(2) "Sterilise instruments."

This is not a big job in any practice, and the process does not need to hold up normal duties.

(3) "Give anaesthetics under direction."

Surely this is the job for the surgeon. If you are going to watch and instruct, then you may as well do the job yourself. Furthermore, if death should be due to an anaesthetic, then we would feel happier if administration had been at the hands of a surgeon. Allow these nurses to give anaesthetics and you will soon have them doing "minor ops."

(4) "They would be useful for routine care of patients in veterinary hospitals."

But are these hospitals necessary? It is very obvious that an animal is much happier in the care of its owner. I doubt if any small-animal practice, carrying out a lot of surgical work, feels the need for a hospital.

(5) "They will dispense medicine."

The days of dispensing are practically over. The drug houses can produce, more attractively, the necessary article, as cheaply as we can.

(6) "They would examine blood, urine, skin scrapings, faeces along with the duties of a radiologist and radiographist."

Well, well, what marvellous people they are going to be. They will know so little about so many things that they will probably be of little use at any one thing.

We are further comforted by the suggestion that release from such routine work would give us practitioners more time for truly professional work. What is truly professional work? If we have many more duties taken from us we will be unemployed. Already the Ministry is giving us less and less work, and we have to be on our guard against losing herd fertility problems to the A.I. Centres. Animal clinics take another slice.

One may ask if this scheme is really necessary; then why was it not suggested years ago? If there is a need now, there was a need then. Of course, we have had animal nurses, *i.e.*, grooms, in racing establishments, for years.

Recent graduates would do well to remember that if such a thing as a "depression" should come then these animal nurses—if we accept them—will assume a position of more importance than assistants for two reasons:—

(a) Nurses are cheaper.

(b) Nurses are more stationary.

To suggest that the R.C.V.S. would protect the position of assistants in such circumstances means nothing. This same body did nothing for those graduates of 1939-41, many of whom were unemployed for two years after the graduation ceremony.

It is agreed that if you wish to give a first-class service to your clients the practice should carry an extra assistant more than you need. True, this assistant may then get a few routine jobs to do, but you have the professional staff there and you can give immediate attention to any urgent calls. Employ one of these nurses and your extra assistant will have to go—your service then suffers.

The various animal societies will probably welcome this scheme. Provide them with these nurses and then the next step will be an appeal from the societies for some of the nurses to be given licences to practice—chiefly because it will be cheaper to employ a licensee than a veterinary surgeon.

Every scheme presented to us carries with it a threat, *e.g.*, "If you do not train these people someone else will train them." In this case I hope we will make a stand—for once—and reject the scheme or any amended scheme.

Yours faithfully,

J. E. JOHNSON,

2, Carlton Street,
Leicester.

February 14th, 1955.

LEUKAEMIA IN THE HORSE

Sir,—We are most anxious to be able to examine cases of this rare but interesting condition occurring in horses. On general grounds, they are likely to be similar to leukaemia or to Hodgkin's Disease in dogs. They are more likely to be met in an older horse of 15 years or more, but might occur at a younger age. A dull, depressed animal showing enlarged or hardened superficial lymph glands would be indicative, especially if there were also signs of wasting.

We are particularly interested in the blood picture of horses showing such symptoms and would be very glad to send suitable sampling bottles to any veterinary surgeon having such a case. We should also like to be able to obtain a bone marrow sample and a lymph gland aspirate by biopsy, which we would undertake to carry out here or away.

We should be most grateful for any help in finding examples of this rare condition.

Yours faithfully,

Wm. C. MILLER,

The Animal Health Trust Equine Research Station,
Balaton Lodge,
Newmarket, Suffolk.

February 14th, 1955.

DISEASES OF ANIMALS ACT, 1950—GREAT BRITAIN

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period		Anthrax	Atrophic Rhinitis	Foot-and-mouth	Fowl Pest	Sheep Scab	Swine Fever
16th to 31st January, 1955		59	—	5	45	—	45
Corresponding period in	1954	9	—	2	78	—	68
	1953	58	—	1	47	—	74
	1952	17	—	6	11	—	25
1st January to 31st January, 1955 ...		93	—	5	85	—	83
Corresponding period in	1954	22	—	2	186	—	129
	1953	126	—	3	133	—	115
	1952	42	—	17	32	—	67

TUBERCULOSIS (ATTESTED HERDS) SCHEMES

The number of Attested Herds, *i.e.*, herds officially certified as free from Tuberculosis as at 31st January, 1955, was as follows :—

England	Wales	Scotland	Total (Great Britain)
65,058	32,230	33,352	133,640